

Application Serial No. 10/034,785  
Attorney Docket No. 03237.0001U2

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# **I. Amendment to Claims**

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (currently amended): A method for evaluating an air conditioning chiller having a condenser, an evaporator, and a compressor, comprising the steps of:

inputting condenser data and evaporator data into a computing device, which performs the steps comprising:

computing a condenser efficiency loss value based on a condenser relationship between condenser efficiency and the condenser data;

comparing the condenser efficiency loss value to a condenser loss threshold value to assess chiller efficiency;

computing an evaporator efficiency loss value based on an evaporator relationship between evaporator efficiency and the evaporator data;

comparing the evaporator efficiency loss value to an evaporator efficiency loss threshold value to assess chiller efficiency; and

calculating a chiller efficiency loss value by totaling the condenser efficiency loss value and the evaporator efficiency loss value.

Claim 2 (previously presented): The method of claim 1, in which the inputting step comprises:

a person reading instruments measuring condenser parameters and evaporator parameters; and

a person keying the condenser data based on the condenser parameters and evaporator data based on the evaporator parameters into the computing device.

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Claim 3 (currently amended): The method of claim 1, in which the inputting step comprises:

a person reading the condenser data and the evaporator data from a plurality of instruments collectively measuring at least one condenser parameter and at least one evaporator parameter;

a person keying the condenser data and the evaporator data into a portable handheld device; and

the computing device receiving the condenser data and the evaporator data via the portable handheld device.

Claim 4 (previously presented): The method of claim 1, in which the inputting step comprises:

reading the condenser data and the evaporator data from one or more electronic sensors that collectively measure at least one condenser parameter and at least one evaporator parameter.

Claim 5 (currently amended): The method of claim 1, in which the inputting step comprises:

enabling a portable handheld device to read the condenser data and the evaporator data from a plurality of electronic sensors that collectively measure at least one condenser parameter and at least one evaporator parameter; and

receiving the condenser data and evaporator data via the portable handheld device.

Claim 6 (previously presented): The method of claim 1, further comprising the steps of:

A. enabling a user using a client computer to remotely via a computing network access a server computer associated with the computing device, and

B. transmitting from the client computer to the server computer the condenser data and evaporator data.

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Claim 7 (currently amended): The method of claim ~~170~~, further comprising the steps of:

~~A. enabling a user using a client computer to remotely via a computing network access a server computer associated with the computing device, and~~

~~B. transmitting from the server computer to the client computer an indication of a condenser remedial action and an evaporator remedial action.~~

Claim 8 (previously presented): The method of claim 7, further comprising the step of enabling a provider of services associated with indication of a condenser remedial action and the evaporator remedial action to receive monetary compensation from a recipient of the services.

Claim 9 (currently amended): The method of claim 7, further comprising the steps of:

~~A.C.~~ enabling the user using the client computer to log on to the server computer;

~~B.D.~~ transmitting from the server computer to the client computer an indication[[s]] of a plurality of chillers about which a user can select to receive information;

~~C.E.~~ enabling the user to select at least one of the plurality of chillers; and

~~D.F.~~ transmitting from the client computer to the server computer an indication of the selected at least one chiller.

Claim 10 (previously presented): The method of claim 9, in which the plurality of chillers includes a first chiller located at a different place from a second chiller.

Claim 11 (previously presented): The method of claim 9, in which the plurality of chillers includes a first chiller installed in the same building as a second chiller.

Claims 12–38 (canceled)

Claim 39 (currently amended): A computer-readable medium having a program for evaluating an air conditioning chiller having a condenser, an evaporator, and a compressor, comprising logic for:

inputting condenser data and evaporator data into a computing device;

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computing a condenser efficiency loss value based on a condenser relationship between condenser efficiency and the condenser data;

comparing the computed condenser efficiency loss value to a condenser loss threshold value to assess chiller efficiency;

computing an evaporator efficiency loss value based on an evaporator relationship between evaporator efficiency and the evaporator data;

comparing the evaporator efficiency loss value to an evaporator efficiency loss threshold value to assess chiller efficiency;

calculating a chiller loss value by totaling the condenser efficiency loss value and the evaporator efficiency loss value.

Claims 40–44 (canceled)

Claim 45 (previously presented): The method of claim 1 in which:

A. the condenser data is selected from the group consisting of:

- i. a condenser inlet temperature;
- ii. a condenser outlet temperature;
- iii. a condenser refrigerant pressure;
- iv. a condenser refrigerant temperature;
- v. a condenser inlet pressure; and
- vi. a condenser outlet pressure; and

B. the condenser loss threshold value is selected from the group consisting of:

- i. an optimal condenser inlet temperature;
- ii. an optimal condenser approach;
- iii. an estimated condenser approach based on when the chiller was made;
- iv. an optimal condenser pressure; and

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- v. an optimal condenser pressure drop.

Claim 46 (currently amended): The method of claim 1 in which:

A. the evaporator data is selected from the group consisting of:

- i. an evaporator refrigerant temperature;
- ii. an evaporator outlet temperature;
- iii. an evaporator refrigerant pressure; and

B. the evaporator efficiency loss threshold value is selected from the group consisting of:

- i. an optimal evaporator approach;
- ii. an optimal chiller water outlet temperature.

Claim 47 (currently amended): The method of claim 1 further comprising the step of inputting compressor data in which the compressor data is selected from the group consisting of:

- A. an actual compressor current and
- B. a full load compressor current.

Claim 48 (currently amended): The computer-readable medium of claim 39 in which:

A. the program further comprises logic for sensing a running current of the compressor motor;

B. the condenser data includes:

- i. information sufficient to define a predetermined optimal condenser approach,
- ii. a condenser refrigerant temperature, and
- iii. a condenser outlet temperature; and

C. the computing logic includes logic for computing:

- i. a fractional load current as the ratio of the running current to a full load current of the compressor motor;

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- ii. a full load condenser approach as the ratio of the difference between condenser refrigerant temperature and condenser outlet temperature to the fractional load current;
- iii. a condenser approach difference as the difference between the full load condenser approach and the predetermined optimal condenser approach; and
- iv. a condenser approach loss component of the condenser efficiency loss value as the condenser approach difference multiplied by a condenser approach efficiency factor if the condenser approach difference is greater than zero.

Claim 49 (previously presented): The computer-readable medium of claim 48 in which the condenser approach efficiency factor is approximately 2.

Claim 50 (currently amended): The computer-readable medium of claim 49 in which:

D. the information sufficient to define the optimal condenser approach is a year in which the chiller was manufactured, and

E. the program further comprises logic for setting the optimal condenser approach as follows:

- i. the predetermined optimal condenser approach is set to approximately one if the chiller was made during 1990 or later;
- ii. the predetermined optimal condenser approach is set to approximately two if the chiller was made during the 1980s; and
- iii. the predetermined optimal condenser approach is set to approximately five if the chiller was made before 1980.

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Claim 51 (previously presented): The computer-readable medium of claim 49 in which the information sufficient to define the predetermined optimal condenser approach is a design condenser approach value.

Claim 52 (currently amended): The computer-readable medium of claim 48 in which the program further comprises logic for:

~~G.D.~~ indicating that the condenser requires service and

~~B.E.~~ suggesting an action that may increase the efficiency of the condenser.

Claim 53 (currently amended): The computer-readable medium of claim 39 in which:

A. the program further comprises logic for sensing a running current of the compressor motor;

B. the evaporator data includes:

- i. information sufficient to define a predetermined optimal evaporator approach,
- ii. an evaporator refrigerant temperature, and
- iii. an evaporator outlet temperature; and

C. the computing logic includes logic for computing:

i. a fractional load current as the ratio of the running current to a full load current of the compressor motor;

ii. a full load evaporator approach as the ratio of the difference between the evaporator outlet temperature and the evaporator refrigerant temperature to the fractional load current;

iii. an evaporator approach difference as the difference between the full load evaporator approach and the predetermined optimal evaporator approach; and

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iv. an evaporator approach component of the evaporator efficiency loss value as the evaporator approach difference multiplied by an evaporator approach efficiency factor if the evaporator approach difference is greater than zero.

Claim 54 (previously presented): The computer-readable medium of claim 53 in which the evaporator approach efficiency factor is approximately 2.

Claim 55 (currently amended): The computer-readable medium of claim 54 in which:

A.D. the information sufficient to define the predetermined optimal evaporator approach is a year in which the chiller was manufactured, and

B.E. the program further comprises logic for setting the predetermined optimal evaporator approach as follows:

- i. the predetermined optimal evaporator approach is set to approximately three if the chiller was made during 1990 or later;
- ii. the predetermined optimal evaporator approach is set to approximately four if the chiller was made during the 1980s; and
- iii. the predetermined optimal evaporator approach is set to approximately six if the chiller was made before 1980.

Claim 56 (previously presented): The computer-readable medium of claim 54 in which the information sufficient to define the predetermined optimal evaporator approach is a design evaporator approach value.

Claim 57 (currently amended): The computer-readable medium of claim 39 in which:

A. the condenser data includes:

- i. information sufficient to define a predetermined optimal condenser pressure, and
- ii. a condenser refrigerant pressure;



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B. the computing logic includes logic for computing a noncondensables component of the condenser efficiency loss value as a noncondensable multiplier times the difference between the condenser refrigerant pressure and the predetermined optimal condenser refrigerant pressure.

Claim 58 (previously presented): The computer-readable medium of claim 39 in which the condenser data includes condenser inlet temperature and a condenser inlet loss component of the condenser efficiency loss value is computed as the condenser inlet temperature times approximately 2.

Claim 59 (previously presented): The computer-readable medium of claim 39 in which:

A. the condenser data includes:

- i. a condenser inlet temperature,
- ii. a condenser inlet pressure,
- iii. a condenser outlet temperature,
- iv. a condenser outlet pressure,
- v. an optimal condenser water pressure drop; and

B. the program includes logic for computing:

- i. an actual condenser water pressure drop as the difference between the condenser inlet pressure and the condenser outlet pressure;
- ii. delta variance as the square root of the ratio of actual condenser water pressure drop to optimal condenser water pressure drop;
- iii. a final variance as  $(1 - \text{delta variance})$  multiplied by  $(\text{condenser outlet temperature} - \text{condenser inlet temperature})$ ; and
- iv. a condenser flow loss component of the condenser efficiency loss value as the final variance times approximately 2.

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Claim 60 (previously presented): The computer-readable medium of claim 39 in which:

A. the condenser data includes an evaporator outlet temperature and an optimal evaporator outlet temperature; and

B. the program includes logic for computing a set point loss component of the evaporator efficiency loss value as approximately two times the difference between the evaporator outlet temperature and the optimal evaporator outlet temperature.

Claim 61 (previously presented): The computer-readable medium of claim 39, in which the inputting logic comprises reading the condenser data and the evaporator data from one or more electronic sensors that collectively measure at least one condenser parameter and at least one evaporator parameter.

Claim 62 (currently amended): The computer-readable medium of claim 39, in which the inputting logic comprises:

A. enabling a portable handheld device to read the condenser data and the evaporator data from a plurality of electronic sensors that collectively measure at least one condenser parameter and at least one evaporator parameter; and

B. receiving the condenser data and evaporator data via the portable handheld device.

Claim 63 (previously presented): The computer-readable medium of claim 39, in which the program further comprises logic for:

enabling a user using a client computer to remotely via a computing network access a server computer associated with the computing device, and

C. transmitting from the client computer to the server computer the condenser data and evaporator data.

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Claim 64 (currently amended): The computer-readable medium of claim ~~39~~73, in which the program further comprises logic for:

~~A. enabling a user using a client computer to remotely via a computing network access a server computer associated with the computing device, and~~

~~B.C.~~ transmitting from the server computer to the client computer ~~the an~~ indication of ~~the a~~ condenser remedial action and ~~the an~~ evaporator remedial action.

Claim 65 (previously presented): The computer-readable medium of claim 64, in which the program further comprises logic for enabling a provider of services associated with indication of the condenser problem and the evaporator problem to receive monetary compensation from a recipient of the services.

Claim 66 (currently amended): The computer-readable medium of claim 64, in which the program further comprises logic for:

~~A.D.~~ enabling the user using the client computer to log on to the server computer;

~~B.E.~~ transmitting from the server computer to the client computer an indication of a plurality of chillers about which a user can select to receive information;

~~C.F.~~ enabling the user to select at least one of the plurality of chillers; and

~~D.G.~~ transmitting from the client computer to the server computer an indication of the selected chiller.

Claim 67 (previously presented): The computer-readable medium of claim 66, in which the plurality of chillers includes a first chiller located at a different place from a second chiller.

Claim 68 (previously presented): The computer-readable medium of claim 66, in which the plurality of chillers includes a first chiller installed in the same building as a second chiller.

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Claim 69 (previously presented): A method of using a computing device for evaluating the efficiency of a chiller having a condenser and a compressor motor, comprising the steps of:

A. inputting into the computing device:

- i. information sufficient to define a predetermined optimal condenser approach,
- ii. condenser refrigerant temperature, and
- iii. condenser outlet temperature;

B. sensing a running current of the compressor motor;

C. computing:

i. a fractional load current as the ratio of the running current of the compressor motor to a full load current of the compressor motor;

ii. a full load condenser approach as the ratio of the difference between condenser refrigerant temperature and condenser outlet temperature and the fractional load current;

iii. a condenser approach difference as the difference between the full load condenser approach and the predetermined optimal condenser approach; and

D. computing a condenser approach efficiency loss as the condenser approach difference multiplied by a condenser approach efficiency factor if the condenser approach difference is greater than zero.

Claim 70 (new): The method of claim 6, in which the server computer performs steps comprising, identifying a condenser problem associated with the condenser efficiency loss value and an evaporator problem associated with the evaporator efficiency loss value.

Claim 71 (new): The method of claim 1, in which the computing device performs steps further comprising:

A. identifying a condenser problem associated with the condenser efficiency loss value and an evaporator problem associated with the evaporator efficiency loss value.

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Claim 72 (new): The method of claim 71, in which the computing device performs steps further comprising:

B. indicating a condenser remedial action and an evaporator remedial action.

Claim 73 (new): The computer-readable medium of claim 63, in which the program further comprises logic for identifying a condenser problem associated with the condenser efficiency loss value and an evaporator problem associated with the evaporator efficiency loss value.

Claim 74 (new): The computer readable medium of claim 39, in which the program further comprises logic for:

A. identifying a condenser problem associated with the condenser efficiency loss value and an evaporator problem associated with the evaporator efficiency loss value.

Claim 75 (new): The computer readable medium of claim 74, in which the program further comprises logic for:

B. indicating a condenser remedial action and an evaporator remedial action.

Claim 76 (new): The method of claim 6 in which the client computer is the computing device.

Claim 77 (new): The computer readable medium of claim 63 in which the client computer is the computing device.

Claim 78 (new): The computer readable medium of claim 63 in which the portable handheld device is the computing device.